

Claims

- [c1] RD 28582
- 8 -
- 1 .A radiation detector, comprising:
- a scintillator which produces UV photons in response to receiving radiation from a radiation producing source; and
- a wide bandgap semiconductor device sensitive to the UV photons produced by the scintillator, said semiconductor device producing an electric signal as a function of the amount of UV photons incident thereon.
- [c2] 2 .The radiation detector as set forth in claim 1 , wherein the wide bandgap semiconductor device is a SiC, GaN or AlGaN device.
- [c3] 3 .The radiation detector as set forth in claim 2 , wherein the semiconductor device is a photodiode or an avalanche photodiode.
- [c4] 4 .The radiation detector as set forth in claim 3 , wherein the semiconductor device is an array of photodiodes or avalanche photodiodes.
- [c5] 5 .The radiation detector as set forth in claim 1 , wherein the wide bandgap semiconductor device has a dark current less than or equal to about 1.0 pA/cm² at about 0.5 VR.
- [c6] 6 .The radiation detector as set forth in claim 1 , wherein the wide bandgap semiconductor device includes a bandgap greater than or equal to about 2 eV.
- [c7] 7 .The radiation detector as set forth in claim 1 , wherein the wide bandgap semiconductor device includes a bandgap equal to about 3 eV.
- [c8] 8 .The radiation detector as set forth in claim 1 , wherein an output of the UV photons from the scintillator substantially matches a responsivity of the wide bandgap semiconductor device.
- [c9] 9 .The radiation detector as set forth in claim 1 , wherein the scintillator includes Li₂ HfO₄ , BaF₂ , CsI, CeF₃ , LuAlO₃ :Ce³⁺ , or Lu₂ Al₂ O₇

Pr^{3+} .

- [c10] 10. The radiation detector as set forth in claim 1, wherein the radiation includes at least one of gamma rays and x-rays.
11. A method of detecting radiation, comprising:
- receiving radiation from a source;
 - producing UV photons in response to the received radiation;
 - directing the UV photons to a wide bandgap semiconductor device which is sensitive to the UV photons; and
 - generating an electric signal with the wide bandgap semiconductor device, said signal being a function of the amount of UV photons incident on the semiconductor device.
- [c11] 12. The method of detecting radiation as set forth in claim 11, further including:
- limiting a dark current of the wide bandgap semiconductor device to be less than or equal to about 1.0 pA/cm^2 at about 0.5 VR.
- [c12] 13. The method of detecting radiation as set forth in claim 11, wherein a bandgap of the wide bandgap semiconductor device is greater than or equal to about 2 eV.
- [c13] 14. The method of detecting radiation as set forth in claim 11, wherein a bandgap of the wide bandgap semiconductor device is greater than or equal to about 3 eV.
- [c14] 15. The method of detecting radiation as set forth in claim 11, further including:
- substantially matching an output of the UV photons to a responsivity of the wide bandgap semiconductor device.
- [c15] 16. The method of detecting radiation as set forth in claim 11, wherein the wide bandgap semiconductor device includes SiC, GaN or AlGaN.
- [c16] 17. The method of detecting radiation as set forth in claim 11, wherein the

UV photons are produced by a scintillator that has the received radiation incident thereon, said scintillator including Li_2HfO_3 , BaF_2 , CsI , CeF_3 , $\text{LuAlO}_3:\text{Ce}^{3+}$, or $\text{Lu}_3\text{Al}_5\text{O}_{12}:\text{Pr}^{3+}$.

[c17] 18. A system for measuring radiation, comprising:
means for producing a number of UV photons in response to received radiation, said number of UV photons being proportional to a level of the radiation; and
means for producing an electric signal as a function of the number of the UV photons.

[c18] 19. The system for measuring radiation as set forth in claim 18, wherein the received radiation is gamma rays or x-rays.
20. The system for measuring radiation as set forth in claim 18, wherein the means for producing the electric signal includes a wide bandgap semiconductor device sensitive to UV photons.

[c19] 21. The system for measuring radiation as set forth in claim 18, wherein the means for producing the number of UV photons includes a scintillator, said scintillator including Li_2HfO_3 , BaF_2 , CsI , CeF_3 , $\text{LuAlO}_3:\text{Ce}^{3+}$, or $\text{Lu}_3\text{Al}_5\text{O}_{12}:\text{Pr}^{3+}$.

[c20] 22. The system for measuring radiation as set forth in claim 21, the system further including:
a reflector, said reflector focusing the UV photons from the scintillator onto the means for producing the electric signal.

[c21] 23. The system for measuring radiation as set forth in claim 18, wherein the system is incorporated into one of a medical imaging apparatus or an oil exploration drilling apparatus.